Notes on Fur Seal Skeletons

Arctocephalus townsendi Merriam

From Stephens, F. , California Mammals, pp. 206 1906
Genus - skull similar to Zalophus but smaller occipital and sag. crests.
"There are no skins of this species in any scientific collection and the species is definitely known only from the skull. There are four weatherworn skulls in the National Museum, only one being reasonably perfect. Dr. Merriam contrasts them with skulls of the Southern Fur Seal from the Galapagos Islands, finding the skull of townsendi to be smaller; rostrum shorter; nasals shorter, etc.
"Type locality, Guadaloupe Island, Lower California.
"The Guadaloupe Fur Seals are known to still occur in very small numbers at the Guadaloupe Islands. It is believed that they formerly occured on the Santa Barbara Islands, and there is a bare possibility that they may be found there again."

From Elliot, D. G. Land and Sea Mammals of Middle America and the West Indies, Pub. Field Columbian Museum, Zool. Ser. Vol. IV, part II, 1904, pp. 543-544. (vol. 2)

"The Fur Seals are best known by the northern animals whose skin has such a high commercial value and whose rockeries or breeding places on the St. George and St. Paul islands of the Pribilof group, are familiar to so many. On a few places like the Guadalupe Island off the coast of Lower California, the Gallapagos Islands, and sundry others about the coasts of Africa, Australia, and New Zealand, a few members of the once great herds of the Southern Fur Seal may still remain, but they seem to be rapidly decreasing in numbers, and recent expeditions have failed to find any living individuals on some of the isalnds mentioned above, and have been able to bring back only skulls or parts of skeletons. Like other animals whose fur has a high commercial value, the prospect that these animals have for surviving the rapacity of man is but slight.

"Arctocephalus. Sea-bears.
$I\ \frac{3-3}{2-2};\ C\frac{1-1}{1-1};\ P\frac{4-4}{4-4};\ M\frac{1-1}{1-1}$ or $\frac{2-2}{1-1}$ 34 or 36

Skull: slender, with facial portion elongate.

townsendi (Arctocephalus), Merr., Proc. Bio. Soc. Wash., 1897, p. 178.

Guadalupe Fur Seal Seal
Type locality. Guadalupe Island, coast of Lower California, Mexico
Geogr. Distr. Guadalupe and San Benito Island,s coast of Lower California, Mexico.
Genl. Char. Skull: palate narrow, excavated; bullae flat; ascending arm of premaxilla short and thick; zygomatic root of maxilla expanded broadly. Upper molars double-rooted, posterior upper premolar incompletely double-rooted.
Color. Skull alone preserved.
Measurements. Basal length, 256; length of Hensel, 233; palatal length, 120; post-palatal length, 125, zygomatic breadth, 151; length of tooth row, 88, distance between canines, 22.5."

General comments from various papers:
(Acomparison of Zalophus with allied species*
Skull in Arctocephalus long and slender but less so than Zalophus.
Zalophus in general configuration (except great development of sag. and oc. cresta in old males closer to Arctodephaline type than any others. (Refers to skull)

General comments continued:
Comparison of Zalophus with Arctocephalus, continued:
Allen, Monograph of North American Pinnipeds, U.S. Geol. Surv. of Terrs. Misc. Publ. 12, pl 284. 1880

"In Zalophus the superior aspect of the skull, before the development of the crest, is strikingly like that of Arctocephalus, as indeed is slaso the inferior aspect, aside from the dental formula. In Zalophus the auditory bullae are rather less swollen than in Arctocephalus, but in all other respects there is a striking resemblance. The anteorbital portion of the skull, however, is more attenuated, and relatively much longer. With this exception there is little difference in the general conformation of the skull in middle-aged females of these two genera, while both differ widely from Otaria, Eumetopias and Callorhinus. The great development of the crests of the skull late in life in Zalophus gives at at that time a highly peculiar conformation."

(Dental formula of Zalophus I3-2; C1-1; P4-4; M1-1 equals 34, no space between upper molars)
(Dental formula of Eumetopias same but with space between last tooth, M1 above, and rest of teeth
(Dental formula of Callorhinus I3-2; C1-1; P4-4; M1-1 or 2-1)
(Dental formula of Arctocephalus same)

In Zalophus the teeth are strongly developed and firmly implanted. All are single-rooted except the last molar, which is imperfectly double-ro rooted. The molars all have a distinctly beaded cingulum on the inner s side. The lower molars and fifth and sometimes the fourth upper molars have a small but distinct anterior cusp. The molars are usually closely approximated, but sometimes there is a sml1 space between the two hinder most of the series, and occasionally they are all slightly and evenly sp spaced. The hinder edge of the last upper molar is generally anterior to or about even with the posterior border of the zygomatic process of the maxillary. When more than five upper molars are present, the sixth or supernumerayr is posterior to the fifth, and is usually smalle smaller than the fifth (sometimes rudimentary) and lacks the accessory cusp of the fifth.

Differences between Arctocephalus and Callorhinus as observed by myslef.

Callorhinus said to have all single-rooted teeth
Arctocephalus has last two double-rooted and third from last incompletely so.

Palatal region, ratio of length of tooth row (from ant. edge canines) to breadth of palate between canines about 25%

Palatal region, ratio of breadth of palate between canines to length of tooth row (from anterior edge of canine to last molar) about 25% in Arctocephalus townsendi and about 34% in Callorhinus.

Callorhinus ursinus (Linneaus) Gray

Allen, Mon. N. Amer. Pinnipeds, U.S.Geol. Surv. Terrs. Misc. Publ. 12, 1880, p. 312

"Molars $\frac{6-6}{5-5}$, small. Facial portion of skull short, broad, convex, and but slightly depressed; nasals short, rapidly narrowing posteriorly. Palatal surface short, narrowed behind, with the hinder border rather deeply concave.---

"Callorhinus, in coloration, character of pelage, size, general form, and dental formula, is rather closely allied to Arctocephalus, from which, however, is is readly distinguished by the form of the facial portion of the skull, which in Arctocephalus is narrower, longer, and much less convex, with much longer nasals. From the other genera of the Oatries is distinguishable not only by coloration and character of the pelage, but by its weaker dentition, and the strongl marked cranial differences, which are too numerous and obvious to require detailed enumeration.

Young and females of Callorhinus and Zalophus are easily separated, aside from differences of dentition, by the shape of the muzzle, but especially by the ascending limb of the intermaxillary. In Zalophus it gradually narrows posteriorly and ends in a slender point near the middle of the nasals. IN Collorhinus it widens posteriorly and ends abruptly quite near the anterior border of the nasals.

p. 320 " In adult aspecimens the breadth of the skull is a little more than half its length, the point of greatest breadth being at the posterior end of the zygomatic arch. The muzzle or facial portion is broad and high, or greatly produced, much more so even than in Eumetopias. The postorbital processes vary from subquadrate to subtriangular, sometimes produced posteriorly into a latero-posteriorly diverging point, as in Zalophus. The post-orbital cylinder is broad and moderately elongated. The post-orbital constriction is well marked, gibing a prominently quadrate form to the brain-case, the latero-a anterior angles of which vary somewhat in their sharpness in different specimens. Yje sagittal and occipital crests are well developed in the old males, nearly as much as in Eumetopias, as are also the mastoid processes. The palatine bones terminate midway between the last molar teeth and the pterygoid hamuli; their posterior outline is either slightly concave, or deeply and abruptly so. The palatal surface is flat, but slightly depressed posterioly, and but moderately so anteriorly. The zygomatic foramens are broad, nearly triangular, and truncate posteriorly. The posterior and anterior nates are of nearly equal size in the males, with their transverse and vertical diameters equal; in the females the posterior nares are depressed, their transverse diameter being greater than the vertical. The nasal bones are much broader in front than behind.

The lower jaw is stringly developed, but relatively less massive than in Eumetopias. The coronoid processes are high and pointed, but much more developed in the males than in the females. The ramial tuberosities are greatly produce, especially the hinder one.

The dentition is relatively much weaker than in either Eumetopias or Zalophus or even in Arctocephalus. ---The molars are small and close ly approximated, with sharply conical crowns and all single rooted. They have no accessory cusp, or only very minute ones in early life. The roots are usually grooved both externally and internal ly, sometimes slightly so, but sometimes so de ply that the fang seems to consist of two connate roots. The distinctness of these groov es varies so that it is not improbably that teeth may be found in which the grooves of the fangs may be enitrely obsolete or so deep as to nearly or quite divide the fang into two distinct roots.

The roots of the molars are very short, and but partly fill their alveoli; hence when the periosteum is removed they fit so loosely that they require to be cemented in to prevent their constantly falling out whenever the skull is handled. The canines and incisors have much longer roots, with more nearly fill their sockets.

The skeleton in its general features resembles that of Eumetopias stelleri, already described. The bones of C. ursinus are, however, all slenderer, or smaller in propotion to their length, than in that sp species, the genreal form of the body being more elongated. The scapulae are shorter and broader than in E. stelleri, the proportion of breadth to length being in the one as 11 to 10 and in the other as 13 to 10. The pelvis is more contracted opposite the acetabula in C. ursinus than in E. stelleri, and the last segment of the stenum is also longer and narrower. The differences in the skull of the two forms have already been pointed out in the generic comparisons. In proportions, the principal difference, aside from that already mentioned as existing in the form of the scapula, consists in the longer neck and longer hind feet in C. ursinus; the ratio of the length of the cervical vertebrae to the whole length of the skeleton being as 15 to 100 in E. telleri,a and as 23 to 100 in C. ursinus; and the ratio of the length of the foot to the tibia being in the former as 13 to 10, and in the other as 16 to 10.

The sexes differ in color, the females being much lighter than the males. In respect to the skeleton they differ extraordinarily in the form of the pelvis, all the parts of which in the female are greatly reduced in size, and instead of the pubic bones meeting each other posteriorly, as they do in the males they are widely separated. The innominate bones are also much further apart in the females, and the bones forming the front edge of the pelvis are less developed, so that the pelvis in the female is entirely open in front. In consequence of the remarkable narrowness of the pelvis in the male, the form of this portion of the skeleton is necessarily varied in the female, to permit of the passage of the foetus in parturition. No such sexual differences are seen in the Phocidae.

In respect to other parts of the skeleton, the absence of the great development of the sagittal and occipital crests seen in the males has already been noticed. The bones of all parts of the skull are much smaller and weaker, especially the lower jaw and the teeth. The attachments for the muscles are correspondingly less developed throughout the skeleton. The most striking sexual difference, however is that of size; the weight of the full-grown females being less than one-sixth that of the full-grown males.

(Records a skull in which there are seven molar teeth on one side and six on the other, and another with five on each side; the normal being six -- this for the upper jaw)

In cranial characters Callorhinus ursinus, al already noticed, is widely different from any of the species of Arctocephalus, to which however, it is most closely allied. While in the latter the facial portion of the skull is narrow and depressed, in C. ursinus it is broad high, and short. The ascending portion of the intermaxillae is also much broader and shorter, and the whole dental armature is much weaker.

Extremes of sexual variation are present by C.ursinus and A. australis; the former presenting the greates and latter the least amoung of any of the five Ameican species compared. The adult males differ little in size, while the female of A. australis is much larger than that of C.ursinus. Average length of skull in males of both is 245mm.; female of australis 233mm, of ursinus, 185mm.

Key to genera and species as presented by Allen (ref. given on page 4) pp. 208-211

A. Pelage harsh, without under-fur. Ears short. Molars 6-5 or 5-5. Species generally of large size. Color yellowist-brown; reddish-brown when young -------- - - - - -- -- - - -Trichophocacae

I. Genus Otaria

Palatine bones extending nearly to the pterygoid processes, deeply concave, truncate behind. Molars 6-5.

1. Otaria jubata ("Forster") Blainville

Galapagos Islands and coasts of South America from Peru and Chili on the Pacific side, and Rio de la Plata on the Atlantic side southward

II Genus Phocarctos

Palatine bones ending considerably in front of the pterygoid processes deeply concave in front, narrowed and emarginate behind. Molars 6-5.

2. Phocarctos hookeri (Gray) Peters

Auckland Islands.

III Genus Eumetopias

Palatine bones ending very far in fron of pterygoid processes, flat, or nearly so;hinder border hollowed or emarginate. Molars 5-5; fifth pair separated by a considerable space from the fourth pair.

3. Eumetopias stelleri Peters

Pacific coast of North America from California to Alaska; Pacific coast of Asia from Japan northward.

IV. Genus Zalophus

Palatine much as in Eumetopias. Sagittal crest very high. Interorbital region greatly constricted. Molars 5-5, in a continuous series.

4. Zalophus californianus (Lesson) Allen

Coast of California

5. Zalophus lobatus (Gray) Gill

Australian Seas. Japan??

B. Pelage soft, with abundant under-fur. Ears longer. Molars 6-5. Size smaller. Color gray; balck when young -v- - - - - Ouliphocaeae

V. Genus Callorhinus

Facial portion of skull short, convex. Molars 6-5.

6. Callorhinus ursinus Gray

Shores of North Pacific, from California and Japan northward.

VI Genus Arctocephalus

Facial portion of skull slender, elongated, pointed, gently declined. Molars 6-5, much large than in Callorhinus.

7. Arctocephalus australis (Zimmermann) Allen

Galapagos Islands and shores and islands of South America from Chili and the Rio de la Plata southward.

8. Arctocephalus antarcticus, Cape of Good Hope

9. Arctocephalus forsteri, Australia, New Zealand, Auckland Island --

References

Arctocephalus townsendi

Stephens, F., California Mammals, 1906, p. 206 (no illustration)

Elliot, D. G., Land and Sea Mammals of Middle America and the West Indies, Publ. Field Columbian Museum, Zool. Ser. Vol IV, part II, 1904, pp. 543-544 (vol. 2) (Dorsal, ventral, lat. of skull)

Jordan, D.S. Fur seals and fur-seal islands of the North Pacific Ocean, part 3, 1899, p. 271- quotes Merriam's original description.

Callorhinus ursinus

Elliot, D. G., A synopsis of the mammals of North America and the Adjacent seas. Pub. Field Columbian Museum, Zoological ser. Vol II, 1901, p. 357 (skull illustrated in 3 views, jaw in one)

Allen, J. A., Monograph of North American Pinnipeds. U.S. Geol. Surv Terr., 1880, pp. 312 on. Gives short comparison with Arctocephalus australis. (Skull illustrated for Callorhinus, but is not a photograph)

References for Sea Mammals

Beddard, Whales (whales, dolphins and porpoises--best description)

Elliot, Synopsis of Maammals of North America and Adjacent seas. Field Mus. Pub., 1901, vol. 2. (pictures of skulls of sea otter, sea lion, sea elephant, walrus, whales, etc.) seal and furseal

Elliot, The Land and Sea Mammals of Middle America and the West Indies. Field Mus. Publ. Zool Ser. vol. IV, part II, 1904 (vol. 2). (pictures as above (except whales are in vol. 1) and Guadelupe fur seal instead of Alaska)

Allen, Monograph of North American Pinnipeds, U.S. Geol. Surv. of Terrs. Misc. Pub. 12, Mostly text, few drawings. Gives key. (1880)

Stephens, California Mammals (short descriptions, more like a list) 1906

Howell, A. B. Aquatic Mammals, 1930 (Comparative drawings of various parts of skeleton of various kind of sea mammals, muscle attachments shown in some)

Howell, Contribution to the comparative anatomy of the eared and earless seals (Genera Zalophus and Phoca). Proc. U.S.Nat. Mus. vol. 73, pp. 1-142, 1928. (Comparative drawings very much as in the 1930 publication but limited to Zalophus and Phoca. Good for comparison of these two, very complete)

Jordan, D. S. The Fur Seals and Fur-seal Islands of the North Pacific Ocean, part 3, 1899. (beginning p. 272 gives account of the southern Fur seal. Quotes Merriams original description of A. townsendii)